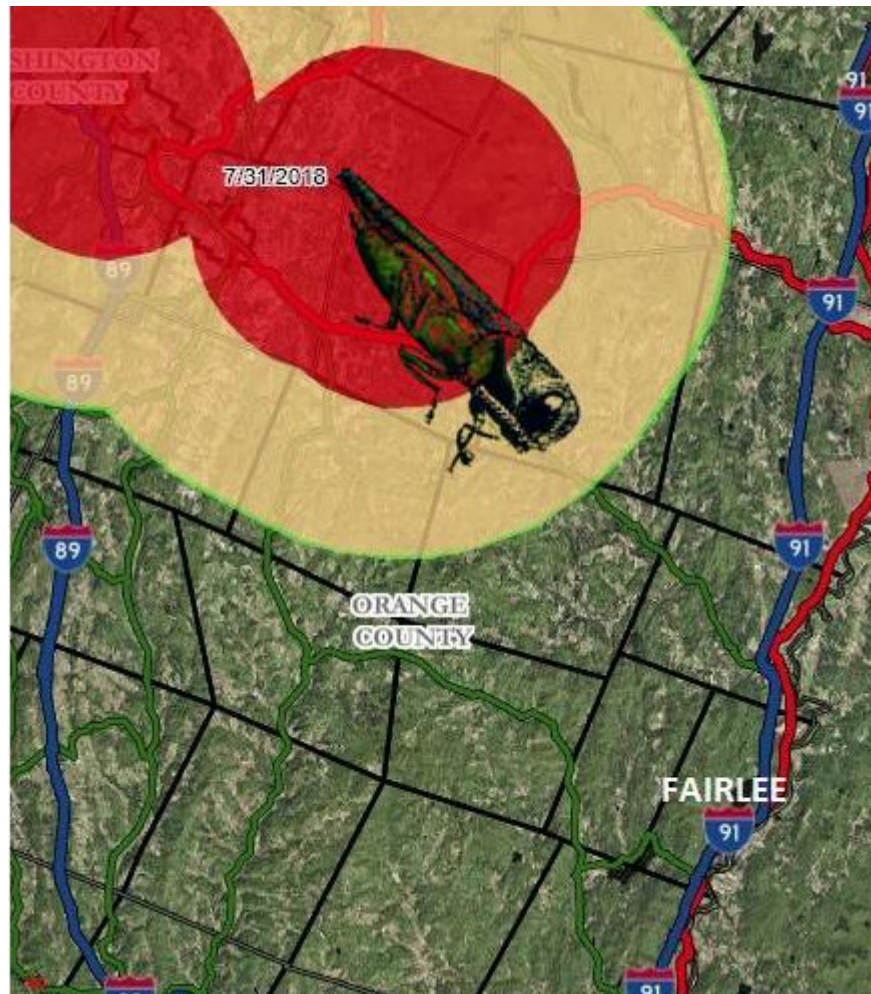


Town of Fairlee Emerald Ash Borer Preparedness Plan

Version 1.1

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Executive Summary

The emerald ash borer (EAB) will probably kill all the untreated ash trees in Fairlee within the next 20 years or so. We cannot stop this from happening, but we can prepare for EAB by taking action before, during and after the onset of EAB in Fairlee. Unlike towns elsewhere in the USA and Canada, where entire neighborhoods were filled with ash trees that required massive and expensive removal operations, ash was not planted in the main downtown area of Fairlee and is not present in high concentrations anywhere in Fairlee. Therefore, the destruction of ash trees by EAB will not be a catastrophic event. Someone visiting Fairlee 25 years from now will probably notice nothing unusual.

However, for those particular locations with prime ash specimens, the loss of these ash trees could have significant impact on the local environment, quality of life, loss of valuable lumber and even lower property values. These impacts can be minimized with some advance planning, and the purpose of this plan is to provide guidance for such planning and to suggest actions to mitigate the EAB impact on Fairlee.

The first step for the owners and managers of town, forest and private land is to prepare an inventory of the existing ash trees. Next it needs to be decided if and when these trees should be removed or if they should be given chemical treatment to prevent EAB from killing the tree. The town needs to identify all ash trees on town property or right-of-ways and decide on the course of action for each tree. A location for disposal of suspect ash wood needs to be identified.

Regarding the Fairlee Forest, similar planning needs to be done, and we also must address the issue of invasive plant species in the future taking over the areas where the ash used to grow. We propose to perform aerial surveys of ash in the spring at just the time of year when virtually all other trees have leafed out, ash being the last common tree to sprout leaves in Fairlee. If invasives are an issue, efforts should be made to remove them before or as the ash trees die from the EAB attack.

Private land owners in Fairlee are free to address EAB as they see fit. All Fairlee residents are encouraged to seek out information about EAB, including learning how to identify ash trees, how to identify EAB signs and how to plan and respond to the EAB attack. This plan provides a starting point for this information and the links in the resources section provide much more detailed information.

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1. Introduction

The emerald ash borer (EAB) is an invasive insect, originally from Asia, that somehow hitchhiked a ride (probably on pallet wood) to the Detroit, Michigan area and has been spreading from there and killing ash trees throughout eastern North America ever since (Figure 1). Until this spring, Vermont had been spared the invasion and we had suspected that EAB's first Vermont detection would be in a southern location such as Bennington County or in the northwest from Quebec (see red dots Figure 1). But instead, its first detection in Vermont was in the town of Orange, much closer to Fairlee than expected. At the time of this writing, the EAB has been positively identified in the towns of Orange and Montpelier and it has likely spread further, perhaps as far as the northwest corner of Corinth (Figure 2). Therefore EAB is currently 10 -15 miles from the NW corner of Fairlee (outer orange and red areas in Figure 2 or updated map [here](#)). EAB spreads naturally about 1-2 miles per year so at that rate it is expected to reach Fairlee in 5 -15 years or sometime between 2023 and 2033. It could happen sooner if someone transports infested wood closer to Fairlee; human-facilitated movement of infested wood is how EAB has spread so quickly nationwide.

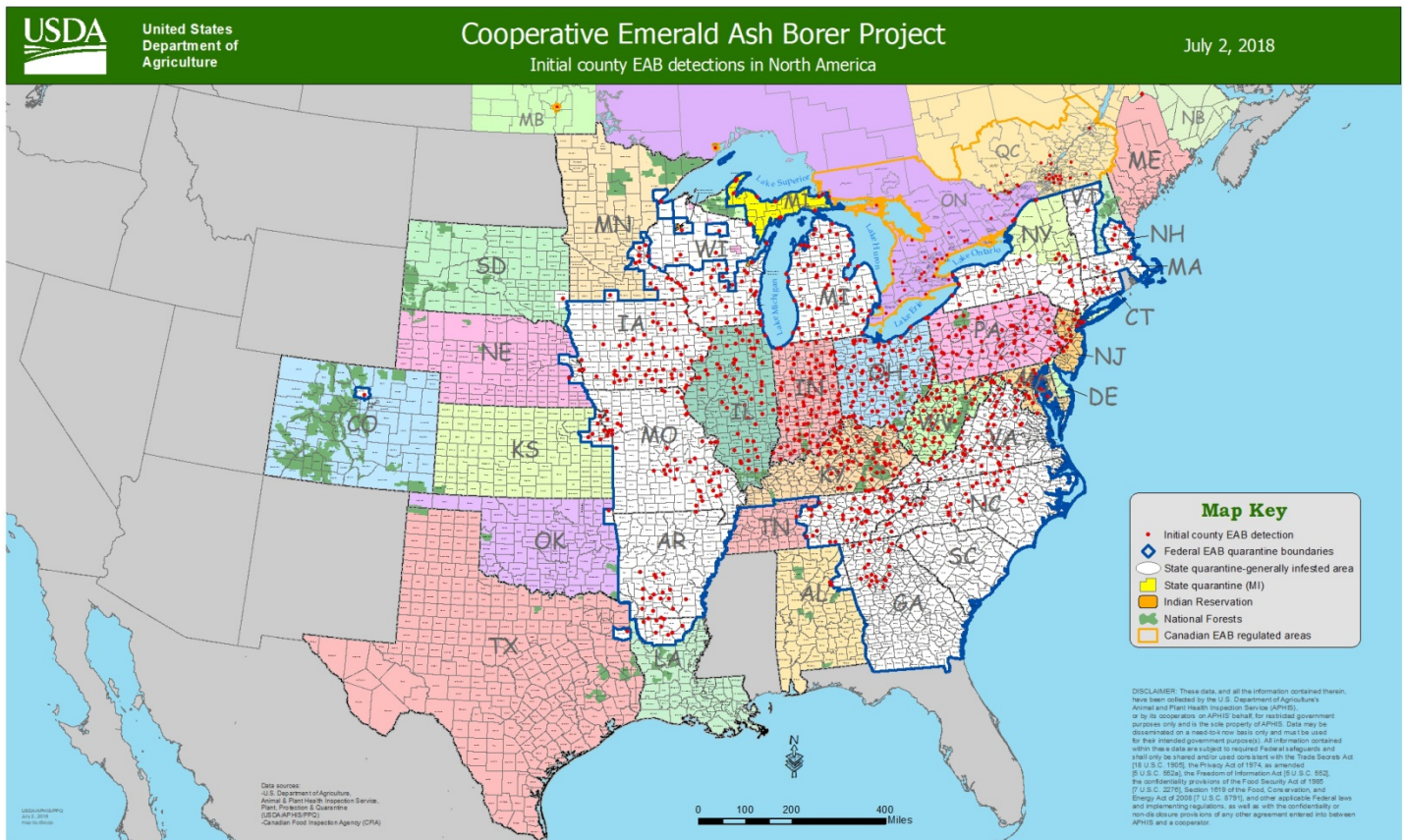


Figure 1. Map showing locations of Emerald Ash Borer in North America. This is the July 2, 2018 version. Notice that all of Vermont is in the Federal EAB quarantine (bounded by blue line) but Grafton County in NH is not. This map is continuously updated, check the latest version at http://www.emeraldashborer.info/documents/MultiState_EABpos.pdf

The main damage from EAB comes from the larvae, which construct tunnels in the cambium layer just beneath the bark. Eventually the tree trunk will be girdled and the tree will die. The entire process from initial infestation to tree death takes 3 – 5 years. Individual trees can be saved with ongoing insecticide treatment (discussed later) but there is no effective general treatment for controlling the natural spread of EAB, although we can try to prevent the much more rapid human-transported spread. It is very likely that virtually all untreated ash trees in Fairlee will be killed in the next 20-25 years, or sooner if human-aided spread occurs.

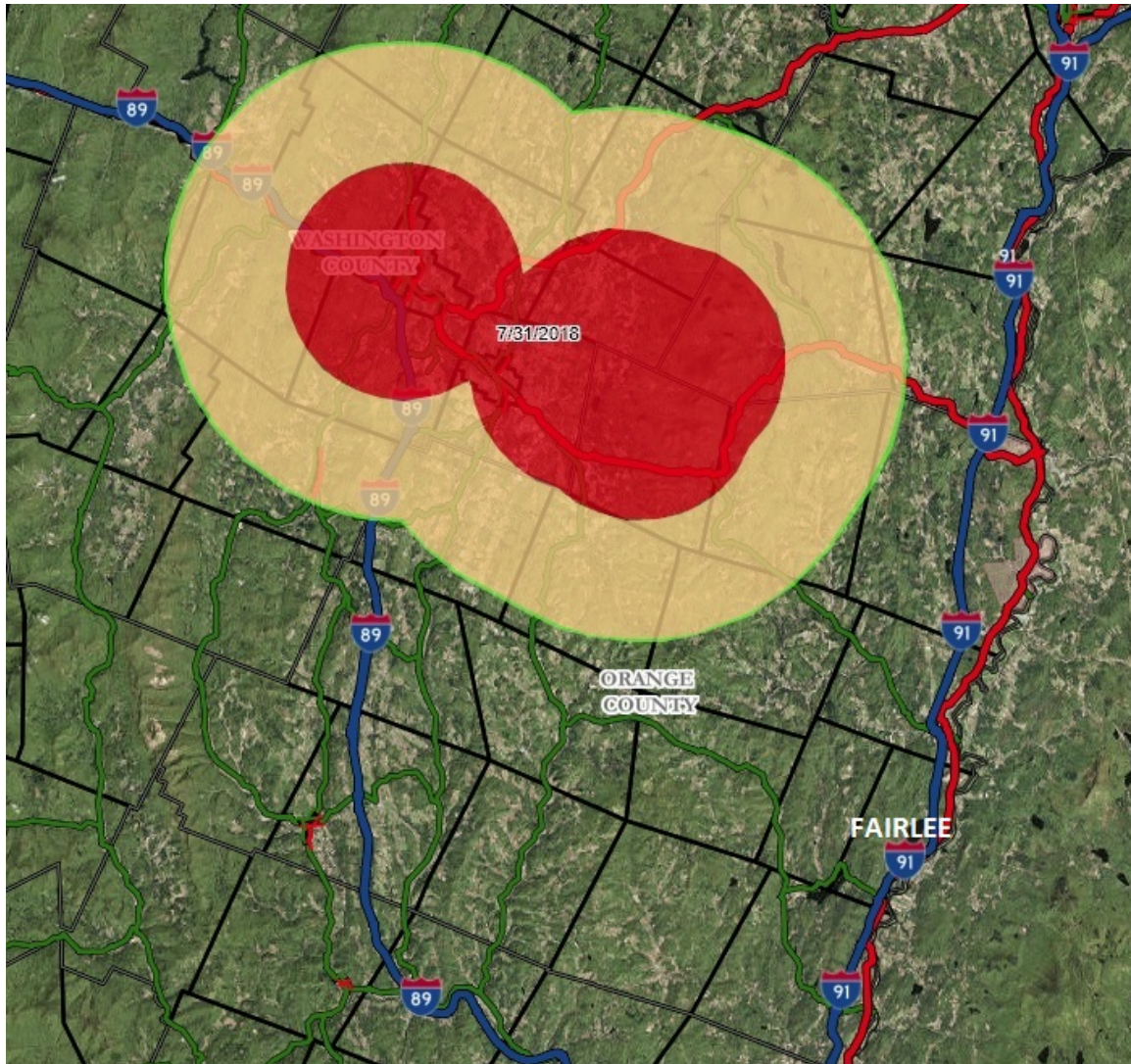


Figure 2. Map of east central Vermont showing area of infested EAB areas (red) and high risk areas (yellow). The red area extends 5 miles from any known confirmed identification and is very likely infested. The yellow area extends 5 miles from that and EAB may be in these areas also. Note that EAB is hard to detect and these maps are approximate. The EAB areas are growing, this map is continuously updated and, be sure to check the latest version is available at <http://vtanr.maps.arcgis.com/apps/PublicInformation/index.html?appid=cfd1464b7b9103a3d7806f0cc5>

We cannot prevent EAB from infesting Fairlee. Instead, this plan will offer a strategy for planning and taking action before the inevitable EAB attack, in order to (1) minimize the environmental and fiscal costs associated with the EAB damage and (2) prevent potential public safety hazards and associated liability risks.

This plan is organized in a report format. Following this introduction is some background information, including how to identify ash trees and EAB presence. After that are separate plans for the (1) Urban Town, (2) Fairlee Forest and (3) Private Lands.

Finally, there are links to a variety of resources regarding ash trees, the emerald ash borer, and how best to respond to the meeting of the two.

2. Background

2.1 Ash Trees in Fairlee

The emerald ash borer attacks all types of ash trees. Here in Vermont we have three species of ash: White (*Fraxinus Americana*), black (*Fraxinus nigra*) and green (*Fraxinus pennsylvanica*). White ash (Figure 3) is by far the most common ash species in Vermont, and is the only type of ash observed by the author in Fairlee, although the other types may also be present in small numbers. For this plan, we will assume that, unless otherwise noted, the word “ash” refers to white ash. Ash is quite easy to identify due to its distinctive bark pattern, typically bare (unbranched) lower trunks, compound leaves and opposing-twig branching. More details on ash identification can be found in a variety of online and hardcopy sources.



Figure 3. White ash (*Fraxinus Americana*). Note compound leaves and opposing twig branches (left image), also observable in winter. The bark of white ash is fairly distinctive with deep ridges and furrows on mature trees (right image). Also note the long trunk with no branches or branch scars; this is typical of ash in wooded areas. Maple trees are the only other common Fairlee tree with opposing twigs, but maple bark is much different from ash so they are easy to distinguish, even in winter.

Ash is a significant, but not major, component of Fairlee’s trees, estimated by the author to comprise approximately 3-5% of the total trees in Fairlee in terms of canopy coverage or board feet. This is only a rough estimate, and similar to all tree species in Fairlee, we know the ash coverage is highly variable in space. Later, we will describe plans for tree surveys that will better quantify the ash distribution in Fairlee.

2.2 Detecting EAB

Making a definitive (“diagnostic”) identification of EAB is often difficult but there are signs (“non-diagnostic”) that can alert the observer to examine the suspect tree more carefully for EAB. The non-diagnostic signs could be due to other causes, in particular ash yellows, which is caused by the *Candidatus Phytoplasma fraxini* bacteria and is fairly common in the Upper Valley area. This section is not intended to be a definitive guide for EAB identification; please see the reference section for many excellent web links on identifying EAB.

Of course, one first must be able to identify an ash tree ([link here](#)). Then look for the following symptoms: (images from Figures 5 -10 from <http://msue.anr.msu.edu/uploads/resources/pdfs/E2938.pdf>)

- Tree crown dieback – look for dead or thinning areas in the tree canopy (Figure 6.)
- Epicormic sprouting (sprouting of lower inactive buds) – look for brushy growth near the base of the tree (Figure 7)
- Woodpecker activity – look for torn, lighter colored bark (Figure 10)
- Cracks in the bark – occur over active EAB tunneling regions (aka “galleries”) (Figure 8)

If any of these symptoms are observed, further inspection should be done, preferably by an expert or trained individual. The following signs are diagnostic (for the Fairlee area):

- Identification of actual individual adult (Figure 4) or larvae (Figure 5)
- S shape “galleries” under bark due to larvae feeding (Figure 9)
- Small (3 mm wide) D-shaped exit holes (Figure 9)



Figure 4 An Emerald Ash Borer Adult



Figure 5 A Emerald Ash Borer Larva



Figure 6 Canopy die back begins.....and progresses until the tree is bare



J. Smith, USDAAPHISPPQ

Figure 7 Epicormic shoots. Leaves are often larger than normal



Figure 8 Bark Splitting vertical fissures. Galleries exposed under split.



Figure 9. EAB is the only insect in this area that make serpentine (curvy) tunnels (“galleries”) under the bark. Note D-shaped exit holes in right image, also unique to EAB.



Figure 10. Woodpecker activity can be a good clue for EAB presence. Look for lighter areas of bark (right image) that indicate a woodpecker peeled the bark off in search of food.

2.3 Plan Approach

Fairlee is not alone; thousands of communities in North America have already been affected by EAB and therefore there is a considerable knowledge base regarding the most effective strategies for mitigating its negative effects. The Vermont Urban and Community Forestry Program (VTUCF) (<https://vtcommunityforestry.org/>) and Vermont Invasives (<https://vtinvasives.org/>) provide excellent resources for developing EAB response plans, and several Vermont communities have already developed EAB response plans which the author referred to as examples (see resource list below). However, unlike other plans, this plan specifically addresses three different areas within the Town of Fairlee: (1) “Urban” Town, (2) the Fairlee Forest and (3) Private Land. Each of these areas have unique issues with regard to EAB planning.

The general plan for all areas is (in the order specified): (1) Create an EAB response management team, (2) develop an ash tree inventory, (3) develop a specific action plan,

and (4) carry out the actions appropriate for the expected EAB infestation timeline. In the following sections, the specific plan for each area will be presented, along with the recommended actions.

3. Management Team

VTUCF recommends identifying all people who can help develop and implement this EAB plan. The author suggests creating a management team of 6 or 7 people consisting of:

One Fairlee Selectboard representative
One Fairlee Forest Board representative
Town Manager – Tad Nunez
Town Tree Warden – Larry C. Martin
Fairlee EAB Response Coordinator – Peter Guest
One or two volunteer residents

The duties of the management team will be to review (and edit) the initial EAB plan, make critical decisions on course of action, approve changes and additions to the plan and oversee the carrying out of the required actions. The Selectboard will have the final authority on all decisions and the Forest Board will approve any actions involving the Fairlee Forest. If approved by the Selectboard and the Forest Board, the author of this plan, Peter Guest, will serve as the overall coordinator of the Fairlee response to the EAB for all three areas (Urban, Forest and Private Land) and will keep all relevant parties informed on the progress of our response efforts. In addition to the Town officials and Forest Board members that are listed as management team members, we hope and encourage other community members to become involved in the EAB response effort. This plan is intended to be a “living” document, to be updated, edited and extended as the timeline progresses (i.e. the EAB gets closer to Fairlee) and new information becomes available. For example, most of the specific decisions on actions regarding individual trees or forest tracts will need to be made *after* the tree inventories are completed.

4. Urban Town

4.1 Definition

The Urban Town, as defined in this plan, includes all town-owned public areas such as the town common, the train station, the cemetery, the transfer station, the beach and also non-public areas such as the town garage and water system areas. Also included are all right-of-ways on town roads (a total of 17 miles). Fairlee does not own the land under or alongside the town roads, but it does have public right-of-ways with an easement (typically 49.5 feet wide) that includes responsibility for tree management. The management team needs to confirm this right of way width for Fairlee.

4.2 Ash Inventory

The goal is to identify every mature ash tree in the Urban Town area, as defined above. In some situations, it may not be obvious what entity is responsible for a particular tree if it is near a right-of-way or property boundary. Therefore, the inventory should include all mature ash trees within 20 ft of a town road, and up to 50 ft distance for large trees. Even though these trees may be on private land, they could impact the public roads and it is important to identify these “boundary” trees and establish responsibility before the EAB strikes and removal becomes an emergency. The State of Vermont has the right-of-way for Route 5, but because Route 5 is our “Main” street, it will also be considered as part of the Urban Town area for the ash tree survey. Eventually the ash trees along Interstate 91 in Fairlee should be inventoried (so we know where to look for early warning signs of EAB) but because this area is the state responsibility and the trees are well back from the roadway, this will be a low priority.

Volunteers will record GPS location, diameter breast height (DBH), overall health/quality and potential for hazard or other concerns on the sheet provided in Appendix A. Photographs and more details will be obtained for particularly significant trees (in terms of beauty, history or potential hazard). A special note should be made in the unlikely event that any green ash (*Fraxinus pennsylvanica*) are detected because EAB tends to attack these first and therefore green ash trees serve an “early warning system” to the onset of an EAB infestation in a neighborhood. A sample data worksheet is provided in Appendix A. These records will be entered into a database that will allow visualization (ArcGIS) and data processing (Excel, Matlab) as needed to support the EAB response efforts. Those trees that pose the most hazard will be given priority in the decision-making process described in the next section. Guest and Martin have begun the tree surveys and hope to have this task completed by the end of 2018 (more help could speed things up).

Note: Based on a very quick “windshield survey” it appears that, fortunately, Fairlee does not have many (any?) ash trees in the downtown common area and there appear to be few elsewhere in the central town area along Route 5. Around Lake Morey most ash are in a couple forested patches on the north end. There are some large ones on private property on the south end near the town beach, and a few smaller ones at the town beach.

4.3 Fairlee’s Policies Regarding the Removal of Trees

The management team needs to determine if the Town has the authority to order the removal of EAB-infected trees on private property that may affect public land or right-of-way. If no specific policy exists, the Vermont Tree Warden Statutes authorize the Town Tree Warden to condemn hazardous trees and order their removal. However, the cost of such removal would be on the Town and such trees would have to be removed after they become a hazard, not pre-emptively. The statutes do not specify the procedures for inspection, public notice and control of infected or hazardous trees. To prepare for EAB, the Fairlee Selectboard should take steps to protect public safety and maintain forest health by developing a tree policy defining its (or designated official such as the Tree

Warden) authority in removing hazardous trees on private land (that poses public danger), if such a policy does not exist.

4.4 Recommended Actions

Once the ash trees have been identified in the town properties and town road areas by the inventory process, the management team needs to take several steps to decide what actions to take. These decisions should be made for each tree before the EAB actually invades Fairlee.

Step 1: *Whose tree?* Identify what party is responsible for the tree.

Step 2: *Need immediate action?* Decide if immediate action is needed. If the tree is on private land but could be a hazard (if damaged by EAB) to the public or public property, the landowner should be notified.

Step 3: *Decide fate of tree.* Determine the planned future course of action regarding each tree. If the tree is on public land or a public right-of-way, there is probably no need for immediate action, unless the tree is already a hazard, but the management team will need to decide which of the following courses of action should be taken for each tree identified in the survey:

Action 1: Pre-emptive Removal. This means remove the tree before the EAB attack has occurred in a particular area. This might be appropriate if Fairlee were to have large numbers of ash and needed to spread the removal cost out over several years or if there were areas or trees that were going to be removed in the near future anyway. We won't know for sure until after the survey, but the initial observations suggest the Urban Town areas do not have so many ash that we will be overcome by removal efforts when they die, so it is likely that no pre-cutting will be recommended after the survey.

Action 2: As Needed Removal. This means wait until the tree is dead, under EAB attack, or the EAB is known to be present in the immediate area before removing. The advantage of this method is that we can enjoy the benefits of the tree for as long as possible. It is best to have the tree removed as soon as possible after EAB detection because once the tree has expressed 50% dieback, commercial arborists will not climb the tree and will need to use a more expensive crane. This method will require careful monitoring of the EAB advance through Fairlee and of the ash trees in the "frontlines" of the attack, so that they do not become safety hazards.

Action 3: Insecticide Treatment. The most effective and recommended treatment is systemic injection of emamectin benzoate by a professional. If applied at the recommended 2-year intervals, trees can be protected from EAB indefinitely and at a cost of \$10 – 15 per diameter inch. Trees smaller than 8-inch trunk diameter may be treated by basal soil drench or ground injection using

imidacloprid. (The state of Vermont is not recommending the use of imidacloprid, because of its impact on pollinators.) Several towns, including Hartford, VT, have determined that for most of their urban ashes, treatment is more cost-effective than tree removal. There is always a chance that scientists will find an effective natural treatment that could be used on the saved trees at a later date that would allow the insecticide treatment to be discontinued.

The tree surveyors will identify candidate trees for insecticide treatment. The management team will need to balance the benefits of keeping the tree vs. the potential hazards and fiscal costs of insecticide use (including public objections) and decide which, if any, trees will be slated for insecticide treatment. Once these trees have been selected, we can contact professionals to arrange for cost estimates and start treatment, if needed. Treatment should not begin until the EAB has been detected on the tree or nearby. But it should start before significant damage to the tree has occurred or it will not be effective. This would be in the first year or two of the initial infection. For this reason, this method requires careful monitoring of the EAB advance so that we know when to start applying the treatments.

A problem with insecticide treatment is that there are potential negative environmental impacts since any insect feeding on the tree (and perhaps animals feeding on those) could be affected ([reference](#)). Most likely, there will be members of the Fairlee community who will be strongly opposed to any type of chemical insecticide treatment involving town-owned trees.

Action 4: Do Nothing. For this option, no action is taken and the tree is allowed to die and rot in place. This is OK if the tree is in a location where no one could be endangered by falling branches etc. Most trees in the Urban Town area are near roads, therefore we expect this will not be an option for most ashes. However, there may be some ash trees that pose less hazard than others and these can be a lower priority and be “do nothing” trees, at least for a while.

Step 4: *The role of utilities.* We must determine how the utility companies will be involved, including whether they will pay for some of the tree removal costs (either preemptive or as needed). If the trees are within 10 ft of live wires, specially-trained professionals must perform this work. Green Mountain Power has stated that they will manage ash in their right-of-ways but will not do any pre-emptive removal.

- **Step 5: *Replacements.*** If the decision is made to remove a tree either preemptively or as needed, the management team (or appropriate designees) need to decide what, if anything, will be planted in the location of the removed tree. If there are invasive plants, or other undesirable species under the ash trees to be removed, plans should be made to destroy these and encourage desired native species. A useful tree selection tool developed by VTUCF is at <https://vtcommunityforestry.org/resources/tree-care/tree-selection>.

Step 6: *Final decisions and action.* Once the trees have been identified and entered into the data base, the management team (or their designee such as the Tree Warden) will make the decision on which course of action (see action options 1 – 4 above) should be taken for each tree. Once this decision has been made, the author will create a timeline which specifies when the particular course of action will be performed. Some of the timeline will be referenced to current time (e.g. “by June, 2019”), while other actions will be referenced to the expected EAB arrival at the location in question (E.g., “2 years before expected infection” or “at time of first detection”). The timeline and action plan and updates to these will be made available to the public via the Town of Fairlee website and other methods.

If immediate action is required, the Town Administrator (with Selectboard approval) will take the required steps to have the tree removed, or whatever action is required. Otherwise, the required action will be entered in the timeline and performed when planned, barring unforeseen circumstances. By making the decision regarding each tree before the EAB strikes, we will be able to make the most efficient use of Fairlee’s limited resources and minimize the impact of the EAB on our trees and forest.

4.5 Cost/Benefit Analysis

Before the course of action is determined for the Urban Town ash trees, we will perform a cost/benefit analysis using an EAB [cost calculator](#) developed at Purdue University. For a quick estimate of the cost to remove a living urban tree, the USDA Forest Service for the Northeast suggests \$18.33 per inch DBH removal cost plus \$6.50/inch stump grinding; there may also be a replacement cost. If we assume that a large urban ash would cost \$1000 to remove and replace, and chemical treatment costs \$150/year, then the replacement cost is less than treatment cost after about 7 years. However, this does not account for the benefits of the ash tree, which could include carbon storage, stormwater interception, air pollution removal, reducing heating and cooling costs, esthetics and property value increase. When these benefits are accounted for (many are subjective or impossible to quantify), the overall “cost” of keeping large ash trees alive using chemical treatment may be less than removing the tree for a much longer period than 7 years. Removing standing dead trees is usually more complicated and removal costs are twice as much or more.

The estimate in the previous paragraph is only an example. Local professionals will be consulted regarding the removal vs treatment costs for each individual tree. These cost estimates will then be entered into the Purdue EAB cost calculator tool which produces statistics, graphs and other information regarding different combinations of action options. For example, we can determine the costs per year of chemically treating 10% of the ash trees vs treating none, or treating more. This will allow the management team to make informed decisions on which of the four actions is most appropriate for a particular tree and for considering the required town budgets to address the various option combinations.

4.6 Slowing the Spread of EAB and Disposal of Infected Wood

The Federal Government has declared a quarantine for the entire state of Vermont. This limits the transport of several wood products from within the quarantine zone to outside. At the time of the writing (August 2018), Grafton County NH was not in the quarantine zone but Fairlee was. Therefore, transport of many wood products involving ash across the bridge to Orford is forbidden. Ironically, once Grafton County is declared within the Federal EAB quarantine, those transport restrictions end. However, the Vermont Agency of Agriculture regulates and forbids the movement of known infested material. VTCUF is developing a series of slow-the-spread recommendations. Examples are

- Limiting movement of ash material to locations within the infested area,
- Transporting logs during EAB's dormant period (October – March),
- Chipping infested materials so EAB cannot survive.

Fairlee residents should be especially careful about transporting or accepting any wood products that have even a remote possibility of containing ash from the infected region to the northeast of Fairlee (see Figure 2) or any other infected regions, which is most of the Eastern US and Canada (Figure 1).

To reduce the spread of EAB, the *EAB Management Worksheet for Vermont Municipalities* states that each town needs to determine how the wood, brush and stump grindings from cut ash trees will be disposed. Fairlee needs to determine at least one location in town or nearby where the town contractors and residents can bring cut ash. Fairlee should consider collaborating with neighboring towns in establishing the wood disposal area or “yard” where the wood can be processed and disposed in a manner that will prevent the human-facilitated spread of EAB. Collaboration might also be beneficial if costs can be reduced by sharing chipping equipment, tree service companies, logging companies, and utilization of ash materials for mulch, lumber or other products. Using the ash for firewood is not recommended unless we can be absolutely certain it will not be transported outside of infected areas. Cut ash trees should not be moved during the months May – August because this is the time the adult insects will be emerging and seeking new host trees.

The idea of a disposal yard for ash wood, while recommended by the State, does present issues for Fairlee. If we picked the town transfer station for the disposal site (an obvious choice), that would mean ash wood cut in the northern part of town would need to be transported south a few miles. We would not want to do that if that means bringing infested wood across the EAB infection “front” which may take several years to cross the township, likely starting from the north or west and moving south and east from there. If we are going to have a disposal yard, it might be better to have it closer to the region of initial infestation. Since we don't yet know where that will be, perhaps a few candidate disposal yard locations can be identified in the northern or eastern parts of Fairlee, if any accessible and suitable locations exist. We could also explore the possibilities (at least in

the early stages of the Fairlee EAB infestation) of using disposal sites in towns where the infection will probably already be present when it hits Fairlee such as West Fairlee, Corinth, Vershire or Bradford. Obviously we would need to develop a collaboration with such a town and make it worthwhile for them. Even if we don't collaborate on a disposal site, Fairlee should make contacts with nearby towns regarding the sharing of information on the spread of EAB and resources used to respond. One step would be to send these towns this plan and encourage them to develop their own EAB response plans and consider ways they could collaborate with Fairlee to reduce costs and increase the effectiveness or the response effort.

4.7 Tracking the Spread of EAB

Earlier, it was described how many of the response actions to EAB depend on when a particular area gets infested. It is therefore important to monitor for and track EAB as it approaches Fairlee and once it is within our boundaries. It may take several years for EAB to reach all parts of Fairlee after the first detection and the response planning critically depends on knowing not just when EAB reaches Fairlee, but what part of Fairlee is currently under attack. The Vermont Agency of Natural Resources (VTNR) maintains a map of the EAB in Vermont, updating as new information is received ([map link](#)). However, this map is only as good as the detections and EAB can be difficult to detect. We cannot expect this map to show the exact infestation areas with great accuracy or detail. Therefore, for tracking the details of the spread within Fairlee, it would be helpful to have knowledgeable local resident volunteers on the lookout for signs of EAB. If we get enough information, we will create our own Fairlee EAB map using GIS software (which will also include ash tree location information), if they can provide better detail and accuracy than the VTNR maps. We will also provide all our observation information to VTNR so they can update their map also.

5.0 Fairlee Forest

5.1 Comment

As of this writing, the author does not know how much discussion the Fairlee Forest Board has had regarding EAB, there was no mention of it in any of the recent minutes. This plan is not intended to usurp any plans that have already been made by the Forest Board, but is intended to provide guidance and recommendations based on knowledge gained by the author at a recent workshop and online sources.

5.2 Definition

The Fairlee Forest is comprised of the Fairlee Town Forest and the William H. Lange Memorial Forest. It has an area of 1,573 acres or 2.5 sq. miles. The Fairlee Forest, together with the Brushwood Community Forest, the Bradford Municipal Forest and private land (some of it protected with easements) is sometimes called the "Brushwood Wilderness", and it represents one of the largest undeveloped tracts of contiguous forestland in Vermont or New Hampshire outside of the National Forests and far northern

areas. While the destruction of the ash in the forest is not something we want to happen, the imminent arrival of the EAB into the Brushwood Wilderness and Fairlee Forest provides us with an opportunity to study how a “natural” (i.e. undeveloped) ecosystem responds to a change such as the presence of EAB. We may need to help the regeneration process toward the desirable result of a healthy forest with no invasive or unwanted species taking the place of the ashes.

5.3 Ash Inventory

The Forest Management Plan prepared by Redstart Forestry, Corinth, VT, published estimates of tree concentrations for each of the 18 stands that comprise the forest. Of these, white ash was detected in the 10 stands listed in Table 1. The area represents the basal area (cross sectional area at tree base) of all the ash compared to the basal area of all the trees in the stand.

Table 1. Percentage of White Ash and Recommended Harvest Year Within Each Stand of the Fairlee Forest

Stand	Basal Area	Recommended Harvest** Year
1	small*	> 2029
2	17%	2021
4	small	2020
7	7%	2014
8	9%	2019
9	small	2017
10	small	2023
11	small	2025
12	small	No harvest
13	small	2016
15	small	2016 west parts
17	small	No Harvest

**small” refers to the statement in the Forest Management Plan “and smaller amounts of ... white ash ...” Usually, tree species concentrations greater than 7% were reported so we will assume there are fewer ash than this but probably more than 1% since some were observed.

** All are “selection” harvests

Note that ash is most common in stands 2, 7 and 8 which are located on the slopes of Bald Top Mountain (see map [here](#)). The area amounts of ash in the other stands were not reported, but anecdotally we know there are significant amounts of ash elsewhere in the forest.

To better prepare for and track the spread of EAB within the Fairlee Forest, it would be helpful to have more detailed information on the location of the ash trees. While it would not be practical to count and record every ash tree (as is proposed for the Urban Town

ash trees), we can get good characterizations of the ash coverage in the forest using aerial photography and ground observations. Ash is the last common tree in Fairlee to leaf out in Spring, therefore by performing aerial photography in May at just the right time (when all trees but ash have leaves), we can estimate the canopy coverage of ash in the Forest, which would be expected to be similar to the basal area percentages shown in the Forest Management Plan. The author proposes to fly an unmanned aerial vehicle (UAV) to photograph the canopy. He will then use image processing software to combine the photographs into composite mosaics. From these, he will estimate total ash coverage and other statistics by eyeball inspection of the mosaic images, perhaps with some image processing and/or pattern recognition software support. If successful, the result will be maps showing ash coverage, at details less than the size of an individual tree. With approval, operations would begin in May, 2019 and focus first on stands 2, 7 and 9 and perhaps the other stands in Table 1 in later years if the method proves practical. Later in the year, when the leaves are out and ash ID is virtually 100% reliable, we will check the accuracy of the aerial estimate in a few select ground-based locations.

5.4 Invasives

One of the biggest problems that has been encountered after the destruction of ash trees by EAB is the proliferation of invasive plant species under the dead trees. Preventing the proliferation of invasive plants is a major focus of many previously-created EAB response plans for forests and was devoted considerable attention at a recent Vermont EAB workshop attended by the author.

According to the 2014 Fairlee Forest Management Plan, no invasive plants were found in any of the stands. It is noted that in Stand 4 (which has small amounts of ash) “The Brett Engstrom wetland report indicates that some non-native bush honeysuckle was found in the wetland edges.” However, Redstart Forestry was also contracted to remove invasive plants from the top of Bald Top Mountain in 2017. Therefore, the status of invasive plants in the Fairlee Forest is unclear to the author at this time. But it does appear that invasive plants are not present in most if not all parts of the Forest. Also ash does not appear to exist anywhere in high enough concentrations that its absence will have major obvious impacts on the ecosystem, except for species that depend specifically on ash. This will make the task of responding to the EAB much easier than it has been for some other forest regions, which have more invasive plants and higher ash concentrations.

After the detailed aerial ash tree survey is performed for a particular section of the forest, we can check the areas beneath the ashes to see if any invasive or unwanted plants are present. If needed, volunteers or professionals should then return to these locations to remove the invasive plants before the EAB kills the ash trees. At the time of this writing, it is not possible to estimate how much effort or cost this will involve. After more information on ash and invasive plant distribution in the forest is obtained and compiled, we will update this plan and include better estimates of the required effort to remove any invasive plants under ashes. We also may want to consider planting replacement trees as soon as possible after the ashes die, if it appears that undesirable species will be released otherwise.

5.5 Tracking the Spread of EAB

The success of any anti-invasive plant effort, and also some of the potential salvage actions regarding ash trees discussed later, critically depends on having good estimates of when the EAB will reach a certain area within the forest, and detecting it as soon as possible after it does. Therefore, we want to track the progression of EAB outside and within the Fairlee Forest as accurately as possible. The procedure to do this is essentially the same as what was proposed for the Urban Town; the reader may want to review this section above. We propose to enhance the VTNR EAB map with our own observations and we may create more detailed EAB maps, if possible and needed. Because of its remoteness, it will be challenging to observe the onset of EAB in the Fairlee Forest compared to the developed areas of Fairlee. But, in addition to the management team and Forest board members, we need to encourage people who use the Forest recreationally (or otherwise) to learn how to identify EAB signs and report those signs to someone in the management team. Due to its location in the northwest part of Fairlee, in the direction of the closest EAB (as of August 2018), there is a good chance that EAB's first appearance in Fairlee will be in the Fairlee Forest, making it all the more important to establish a good monitoring program.

5.6 Regeneration of New Ashes

With resistant trees, effective predators and the creation of suitable growing conditions, it may be possible to bring the ash back. Ash trees in Asia, where the EAB is endemic, can tolerate the attacks; scientists are working on breeding or genetically modifying our white ash to develop EAB-resistant strains. Perhaps in the future such trees could be planted in the Fairlee Forest, similar to what was done for chestnut trees.

Once released, ash grows fast and nicely complements more shade-resistant and slower growing maples. But is it worth the effort to try to facilitate the return of the ash? Ash seedlings require at least 0.3 – 0.5 acres of open area to be released, so they would need to be planted or protected in larger clearings; they will not thrive (release) on their own under individual dead trees killed by the EAB. And even if such a planting effort were undertaken, there is a good chance the EAB would kill them all anyway. The author will keep updated on any progress on developing EAB-resistant ash trees, so that the Forest Board can decide in the future whether these should be planted.

5.7 Action Options

The EAB management team and the Fairlee Forest Board, working with their foresters and loggers, need to decide what type of actions should be taken before, during and after the EAB reaches areas of the forest. Regarding each individual ash tree, the choices are similar as for Urban Fairlee: (1) pre-emptive removal, (2) as needed or salvage removal, (3) chemical treatment and (4) do nothing. In the case of the Fairlee Forest, "removal" may just mean cutting the tree and leaving part or all in place.

Action 1: Pre-emptive Removal. Unlike the Urban Fairlee area, it is probably not feasible to remove or even just fell individual ash trees from the Fairlee Forest, unless the action is part of a more general planned logging operation. Pre-emptive removal will not significantly slow the spread of EAB, an unfortunate finding from thorough and vast ash-cutting schemes performed in the Midwest and southern New England in failed attempts to stop the spread. However, the Forest Board may want to consider actions that would result in more removal of ash than would normally occur. For example, they may want to lower the DBH threshold for ash during future planned logging operations. There may be certain individual trees, not in planned logging areas, that pose a special hazard because they are located along a road or trail that could be removed pre-emptively before they die and become a hazard. Trees located along forest roads have the potential to become a hazard, but also these are the easiest to access for removal.

Action 2: As Needed Removal/Salvage. This includes salvage operations and removal of hazardous trees. This approach waits until the tree is dead, under EAB attack, or the EAB is known to be present in the immediate area before cutting. The recommendation from foresters experienced with EAB is to let healthy trees mature until EAB has attacked or is imminent before performing special salvage logging or safety fells. For the Fairlee Forest, this type of operation would probably take place only if a tree becomes a hazard, as discussed in the previous paragraph. Because ash trees are not highly concentrated anywhere in the forest (needs confirmation), large-scale salvage operations of dead or dying trees would probably not be practical.

Action 3: Insecticide Treatment. As discussed in the Urban Town section, individual ash trees can be saved by regularly-applied insecticide treatment. However, in inaccessible locations, such as almost all of the Fairlee Forest, this would not be practical, except perhaps for trees that have special value due to beauty, history or other reasons and are accessible to the professional applicators. The management team needs to decide if any trees in the forest are worth the cost of treatments.

Action 4: Do Nothing. The ash tree is allowed to die, fall and rot in place. This does not mean no actions will be taken at all, but rather that we will not cut or treat the tree(s) in question. We still plan to perform all the other actions discussed in this plan (ash inventory, EAB monitoring, invasive control, and replanting). Although the 20-year outlook for ash in the Fairlee Forest is dismal, there is a glimmer of hope that ash could return as a major canopy tree sometime in the future, after the devastation. In EAB-infested areas, sometimes a single large healthy ash tree, out of thousands, may “linger” and have genes that resist EAB. These valuable trees may be the key for bringing the ash back for our grandchildren to enjoy. In areas where dead or dying trees present little danger to the public, we should leave ash trees standing in hopes that one or more survive. Perhaps an ash tree in the Fairlee Forest

holds the genetic code that will help bring the ash back to North America; we would not want to cut down that one tree! Several small parasitic flies and wasps kill EAB and are especially effective in saplings, where the parasites can reach the EAB under the bark. The hope is that by developing a more-resistant ash tree, and encouraging natural enemies of the EAB from Asia, we will be able to bring ash back. For these reasons, the “do nothing” option will be the best option for the vast majority and perhaps all of the ash trees in the Fairlee Forest.

5.8 Planning Meeting

Undoubtedly, members of Fairlee Forest Board, with their many years of working (and playing) within the forest, have gained substantial anecdotal and scientific knowledge about the forest that would aid our EAB response efforts. The author proposes to discuss the EAB issue at a meeting of the Fairlee Forest Board. The key agenda items would be:

- Update on previous board discussions or actions (if any) concerning EAB
- Board members’ knowledge regarding ash distribution in the forest (beyond what is in the forest plan).
- Board members’ knowledge regarding invasive or other undesirable plants in the forest.
- Discussion of whether any of the planned harvest operations should be modified due to the sooner-than-expected-arrival of EAB.
- Input and hopefully approval from the board about this (Fairlee EAB Response) plan, particularly the sections addressing the Fairlee Forest.

6.0 Private Land

6.1 Definition

Private land in Fairlee includes forestland, fields, and yards that are owned by individuals or corporations. Because a majority of the ash trees in Fairlee are on private land, it is particularly important to involve these landowners in the EAB response effort. Fairlee has no ordinances regarding the cutting of trees on private land, therefore it is entirely up to the individual property owner to decide how to respond to the imminent EAB threat.

6.2 Education

The primary focus of the EAB response plan for private land is to educate the owners and managers about the EAB and the resources available to respond to its inevitable attack on their ash trees. While all landowners in Fairlee have probably heard about the EAB, most probably do not what they should to prepare for the invasion. Hopefully this document and other resources will help the Fairlee landowners make informed decisions about their ash trees.

To get the message out, this plan will be posted on the town website, and we should make available hard copies if requested by residents. The most important educational goals for the Fairlee landowners are:

- Being able to identify ash trees
- Being able to identify signs of EAB
- Knowing how to prevent the spread of EAB
- Knowing the options for responding to EAB

All of these goals are discussed in detail in other sections of this plan. Management of backyard trees and other ash trees near houses and roads is very similar to the guidelines provided above for the Urban Town. Likewise, management of private forests and wood lots should follow the same procedure as specified for the Fairlee Forest section, except that the property owner or his/her designee, will make the decisions regarding the fate of their ash trees.

Regarding the prevention of EAB spread, the best thing for property owners to do with cut ash that may have EAB (i.e. any ash tree in or near the infected areas) is to leave it in place either to rot or burn as firewood on their property. If established they could also bring it to the Town disposal ash wood disposal site. It should not be given away or sold as firewood because the seller cannot control where this firewood may be transported to.

5.4 Action

There is no need for property owners to panic, the EAB will not kill their trees for a few more years. However, now would be a good time for all Fairlee property owners to survey their own property and record or remember the locations of ash trees. (They may also want to note the locations of their hemlocks too, since these trees will have their own deadly pest [woolly adelgid] to deal with soon.) When the EAB gets closer, the property owners should regularly check their ash trees for EAB signs, and if there is any chance that an EAB symptom is present, inform the author of this report or report the suspicious ash tree(s) on VTInvasives.org so that an expert can come to inspect or confirm the infestation and update the infestation maps, as needed.

7.0 Conclusions

The bad news is that we are not going to stop the emerald ash borer from killing our untreated ash trees. Invasive plants will have great opportunities to take over under the dead ash trees. The good news is that the destruction of ash trees in Fairlee will not have major impacts on our downtown areas or forest ecosystems simply because we don't have high concentrations of ash trees. Fairlee also has fewer invasive plants than many other towns and cities.

This plan provides guidance on how Fairlee can minimize the impact of the emerald ash borer on our trees and community. This is intended to be a living document, to be updated as new information is obtained and actions are completed.

Feel free to contact the author (pguest@nps.edu) at any time if you have any questions or comments about this plan, would like to volunteer helping with the ash tree inventory, being on the management team or would like to learn more about looking for signs of EAB. If you do not have a computer, we can provide hard copies of this document and any of the linked documents below

8.0 References and Resources

Vermont Urban & Community Forestry

- <https://vtcommunityforestry.org/>
- https://vtcommunityforestry.org/sites/default/files/pictures/community_prep_flyer.pdf
- https://vtcommunityforestry.org/sites/default/files/pictures/eab_municipal_faqs_final.pdf
- https://vtcommunityforestry.org/EABplans_casestudies
- <https://vtcommunityforestry.org/wood-utilization>

Vermont Invasives

- <https://www.vtinvasives.org/>
- <https://vtinvasives.org/land/emerald-ash-borer-vermont>
- <https://vtinvasives.org/land/emerald-ash-borer-vermont/identify-emerald-ash-borer>
- <https://vtinvasives.org/land/emerald-ash-borer-vermont/identify-ash-trees>

Vermont Emerald Ash Borer Map

- <http://vtanr.maps.arcgis.com/apps/PublicInformation/index.html?appid=cfda013ad1464b7b9103a3d7806f0cc5>

North American EAB map

- http://www.emeraldashborer.info/documents/MultiState_EABpos.pdf

EAB Management Worksheet for Vermont Municipalities

- https://vtcommunityforestry.org/sites/default/files/pictures/eab_municipal_management_2.pdf

Homeowner's Guide to Emerald Ash Borer

- <https://vtcommunityforestry.org/sites/default/files/pictures/homeownerseab.pdf>

EAB Cost Comparison Calculators

- <http://int.entm.purdue.edu/ext/treecomputer/>
- <http://www.urbantreealliance.org/eab-costs/>

EAB Information for Forest Landowners

- http://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Forest_Health/Library/EAB%20Landowner%20FAQs.pdf

EAB Information for Forest Managers

- http://fpr.vermont.gov/sites/fpr/files/Policy%20on%20Forest%20Management%20Plans%20and%20Amendments%20for%20EAB%202018%2004_17%20Final.pdf
- <http://masswoods.org/sites/masswoods.net/files/pdf-doc-ppt/Ash%20Management%20Guidance%20for%20Forest%20Managers.pdf>

Signs and Symptoms of the EAB

- <http://msue.anr.msu.edu/uploads/resources/pdfs/E2938.pdf>
- <https://datcpservices.wisconsin.gov/eab/article.jsp?topicid=18>
- <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/26856.pdf>
- [http://www.lakesaintlouis.com/vertical/Sites/%7B1C3DDF92-5482-4DB6-9D09-7DD43C85DE6A%7D/uploads/Emerald_Ash_Borer\(1\).jpg](http://www.lakesaintlouis.com/vertical/Sites/%7B1C3DDF92-5482-4DB6-9D09-7DD43C85DE6A%7D/uploads/Emerald_Ash_Borer(1).jpg)

Chemical Treatment Information

- <https://vtcommunityforestry.org/sites/default/files/pictures/eabtreatment.pdf>
- https://www.fs.fed.us/nrs/pubs/jrnl/2015/nrs_2015_flower_001.pdf
- http://emeraldashborer.info/documents/Multistate_EAB_Insecticide_Fact_Sheet.pdf
- http://www.emeraldashborer.info/documents/Potential_Side_Effects_of_EAB_Insecticides_FAQ.pdf

Emerald Ash Borer Information Network

- <http://www.emeraldashborer.info/>

State of Vermont EAB Quarantine Announcement

- <http://anr.vermont.gov/node/1180>

US Government Federal Order Putting Vermont In EAB Quarantine Area

- https://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/downloads/DA-2018-18.pdf

Is My Ash Tree Worth Saving?

- <https://hort.uwex.edu/articles/my-ash-tree-worth-treating-emerald-ash-borer/>

My Ash Tree is Dead... Now What Do I Do?

- <http://www.emeraldashborer.info/documents/E-2940.pdf>

What should I plant to replace the ash

- <https://vtcommunityforestry.org/resources/tree-care/tree-selection>

Forest Management Plan for Land Belonging to the Fairlee Town Forest

- http://www.fairleevt.org/wp-content/uploads/2015/01/FairleeTownForest2014_withmaps.pdf

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Appendix A Ash Survey Worksheet

[illegible]

¹This is just to an ID number, start with 1 and work up.

²If you don't have GPS, mark location on a map

³ DBH – Diameter Breast Height, no need to measure directly, estimate from distance is OK

⁴ Comment if special health or quality issues, potential for hazard or other concerns